

Section 45

Heat and Cold Stress

45.1 Scope

This section applies to Bureau of Reclamation facilities to protect employees performing indoor and outdoor work in temperatures that have the potential for heat and/or cold-related illnesses.

45.2 General Requirements

Reclamation's goal is to eliminate or reduce adverse health effects from exposure to high heat and cold temperatures through engineering, work practice controls, employee training, acclimatization, measurements, job task assessments of heat and/or cold stress, the proper use of heat-protective clothing, and personal protective equipment (PPE).

45.3 Responsibilities

45.3.1 Area Office Managers

45.3.1.1 Shall provide the necessary resources to implement and maintain the procedures within this section.

45.3.2 First-Line Supervisors

45.3.2.1 Shall ensure employees receive training according to paragraph 45.4, *Training*, where there is reasonable likelihood of exposures that could cause heat and/or cold stress.

45.3.2.2 Shall coordinate with the safety manager/safety specialist, and the regional/local industrial hygienist (IH) to perform workplace assessments, training, and exposure monitoring as necessary.

45.3.2.3 Shall provide employees performing job tasks in temperatures that can cause heat and/or cold stress with the appropriate controls, equipment, and PPE.

45.3.2.4 Shall make adequate water and shade available at work locations where environmental risk factors for heat illness are present.

45.3.2.5 Shall coordinate with the safety manager/safety specialist, and the regional/local IH, to ensure employees working in environments, that have the potential for cold stress, have access to heated areas that will not expose them to harmful carbon monoxide levels.

45.3.2.6 Shall acclimatize employees performing job tasks in temperatures that can cause heat and/or cold stress.

45.3.3 Employees

- 45.3.3.1** Shall complete the training requirements, as assigned by their first-line supervisor, in paragraph 45.4 of this section.
- 45.3.3.2** Shall review the job hazard analysis (JHA) and the identified precautions and controls before conducting work in temperatures that can cause heat and/or cold stress.
- 45.3.3.3** Shall immediately report any heat or cold related illness symptoms they or their coworkers are experiencing to their supervisor.
- 45.3.3.4** Shall immediately report any heat or cold related illness symptoms they or their coworkers are experiencing to their supervisor.

45.3.4 Regional Safety Managers

Shall provide local safety professionals assistance in developing heat and cold stress procedures, as requested.

45.3.5 Regional and Local Industrial Hygienists

Shall provide technical assistance such as workplace hazard assessments for heat and/or cold stress, exposure monitoring, and training.

45.3.6 Safety Managers/Safety Specialists

- 45.3.6.1** Shall coordinate heat and cold stress training covering the elements in paragraph 45.4 of this section.
- 45.3.6.2** Shall assist first-line supervisors in identifying and implementing safety measures for heat and cold stress program elements outlined in this section.

45.3.7 Human Resources Officers (HRO)

Shall maintain received medical examination results, clearance documentation, and employee exposure monitoring records in the employee's medical folder according to 29 CFR 1910.1020(d)(1), *Access to Employee Exposure and Medical Records*, the Privacy Act of 1974 (P.L. 93-579), and provide the regional/local IH and/or first-line supervisor with the clearance results as requested.

45.4 Training

45.4.1 Heat Stress

First-line supervisors shall work with the safety manager/safety specialist, and the regional/local IH, to coordinate employee training before exposure to work environments that may cause heat stress and must cover, at a minimum, the following elements:

- recognition of the signs and symptoms of heat-related illnesses (e.g., heat stroke, heat exhaustion, heat cramps, heat rash, heat syncope, rhabdomyolysis) and administration of first aid,
- causes of heat-related illnesses and the procedures that will minimize the risk, (e.g., drinking enough water and monitoring the color and amount of urine output),
- proper care and use of heat-protective clothing and equipment,
- added heat load caused by exertion, clothing, and PPE,
- effects of nonoccupational factors (e.g., drugs, alcohol, obesity, etc.) on tolerance to occupational heat stress,
- the importance of acclimatization,
- the importance of immediately reporting to the supervisor any symptoms or signs of heat-related illness in themselves or in coworkers, and
- procedures for responding to symptoms of possible heat-related illness and for contacting emergency medical services and the importance of using the buddy system.

45.4.1.1 First-Line Supervisor Training

In addition to the elements in paragraph 45.4.1, *Heat Stress*, the first-line supervisor shall be trained on the following minimum elements:

- how to implement appropriate acclimatization procedures,
- procedures to follow when a worker has symptoms consistent with heat-related illness, including emergency response procedures,
- how to monitor weather reports,
- how to respond to hot weather advisories, and
- how to monitor and encourage adequate fluid intake and rest breaks.

45.4.2 Cold Stress

First-line supervisors shall work with the safety manager/safety specialist and the regional/local IH to coordinate employee training before exposure to environments that may cause cold stress. The training must cover, at a minimum, the following elements:

- how to recognize the environmental and workplace conditions that can lead to cold stress,
- how to recognize the signs and symptoms of the types of cold stress (e.g., chilblains, immersion/trench foot, frostbite, and hypothermia),
- the importance of immediately reporting to the supervisor any symptoms or signs of cold stress in themselves or in coworkers,
- how to prevent cold stress and administer basic first aid,
- how to select proper clothing for cold, wet, and windy conditions,
- how wind chill affects outdoor temperature, and
- the importance of using the buddy system.

45.4.2.1 First-Line Supervisor Training

In addition to the elements in paragraph 45.4.2, *Cold Stress*, the first-line supervisor shall be trained on the following minimum elements:

- what procedures to follow when a worker has symptoms consistent with cold-related illness, including emergency response procedures,
- how to monitor weather reports for wind chill,
- how to create a work/rest schedule, and
- how to use work scheduling or alternate work schedules to avoid employee exposure to the hottest parts of the day.

45.4.3 Lack of Proficiency

Retraining is necessary when an employee performing work with the potential for heat and/or cold stress symptoms demonstrates a lack of knowledge of work practices or the program elements in this section.

45.4.4 Recordkeeping

All training records shall be kept in the Department of the Interior's approved repository and managed in accordance with the Information Management Handbook as referenced in Reclamation Manual Directive and Standard, RCD 05-01, *Information Management*.

45.5 Hazard Identification, Assessment, and Safety Measures

45.5.1 Hazard Identification and Assessment

The first-line supervisor, in coordination with the safety manager/specialist and the regional/local IH, shall assess the workplace and review outdoor job tasks for potential heat and/or cold stress situations and determine the appropriate controls, equipment, and PPE to reduce employee exposures.

45.5.2 Safety Measures

45.5.2.1 Hierarchy of Controls for Heat Stress

The first-line supervisor, in coordination with the safety manager/safety specialist, and/or regional/local IH, shall implement the appropriate heat stress controls below to reduce employee exposure while performing work activities with heat stress potential:

- increase air velocity,
- use reflective or heat-absorbing shielding or barriers if feasible,
- limit time in the heat and/or increase recovery time spent in a cool environment,
- schedule job tasks or alternate work schedules to avoid employee exposure to the hottest parts of the day,
- use appropriate tools to minimize manual strain,
- increase the number of workers per task and implement a buddy system,
- require self-monitoring and provide adequate amounts of cool, potable water near the work area, and
- institute a heat acclimatization plan.

45.5.2.2 Hierarchy of Controls for Cold Stress

The first-line supervisor, in coordination with the safety manager/specialist and/or regional/local IH, shall implement the appropriate cold stress controls below to reduce employee exposure while performing work activities with cold stress potential:

- determine if the job task can be moved indoors,
- use radiant heat to warm the work area or provide a warm area for breaks,
- shield the work area from wind,
- insulate equipment handles,
- schedule work during the warmest part of the day,
- ensure employees stay hydrated,
- ensure employees stay dry to avoid hypothermia and trench foot,
- schedule frequent breaks in warm areas,
- wear several layers of loose clothing for better insulation (inner layers should be wool or moisture wicking fabrics, outer layers should be wind and water-resistant),
- wear proper clothing (e.g., wool and synthetics, not cotton),
- using a personal flotation device (e.g., PFD, life vest, immersion suit, dry suit),
- have a means of both signaling rescuers (e.g., strobe lights, personal locator beacon, whistles, flares, waterproof radio) and having a means of being retrieved from the water to increase water immersion survival times,
- train supervisors and managers to recognize and react to symptoms of chilblains, frostbite, hypothermia, and trench foot,
- use the buddy system to monitor each other for symptoms of cold stress,
- train supervisors, managers, and employees on how to use the National Oceanic Atmospheric Administration's (NOAA) wind chill chart, and
- provide cold weather PPE.

45.6 Pre-job Briefing and Planning Requirements

45.6.1 JHA

The first-line supervisor, in coordination with the safety manager/specialist, shall ensure that the procedures for providing first-aid and where to get medical care are included in JHAs when heat or cold stress has been identified as a real or potential risk factor.

45.6.2 Protective Clothing

The first-line supervisor shall ensure employees performing indoor and outdoor work in temperatures that have the potential for heat and/or cold related injuries/illnesses use the appropriate PPE.

45.6.2.1 PPE Worn in Hot Work Environments

The first-line supervisor, in coordination with the safety manager/specialist and/or the regional/local IH, shall determine the appropriate PPE to use in hot work environments and ensure it provides adequate protection with the lowest estimated increase to the employee's core temperature. If the type of PPE worn may increase

the employee's core temperature, then first-line supervisors must implement work/rest cycles considering the following elements:

- type of PPE,
- length of time the employee wears PPE,
- employee's fitness level, hydration level, and acclimatization, and
- environmental conditions (e.g., heat, humidity, radiant heat from the sun, wind speed).

45.6.2.1.1 Rest Breaks. The first-line supervisor shall implement the following elements during rest breaks to reduce the employee's core temperature:

- take off any removable PPE,
- ensure employees are rehydrating, and
- ensure there is a cool environment (e.g., air-conditioned room, vehicle, or shaded area) for employees to rest in.

45.6.2.2 PPE Worn in Cold Work Environments

The first-line supervisor, in coordination with the safety manager/specialist and/or regional/local IH, should consider the follow when selecting PPE to use in cold work environments:

- at least three layers of loose-fitting clothing for better insulation (i.e., an inner thermal layer, a middle of wool or moisture wicking material, and an outer wind and rain protection layer),
- face covering for protecting the face and mouth,
- head, face, and neck coverings,
- cold weather gloves,
- waterproof, insulated boots, and
- reflective gear for employee visibility during shortened daylight hours.

45.7 Safe Practices

45.7.1 Heat Acclimatization

The first-line supervisor, in coordination with the safety manager/safety specialist, shall ensure employees gradually increase the intensity of work performed in a hot environment by gradually increasing work time in hot conditions over a period of 7 to 14 days and from cooling off and fully rehydrating between shifts.

45.7.1.1 Acclimatization Plan for Employees Working in the Heat

First-line supervisors shall create an acclimatization work plan that addresses the following elements below recommended by the National Institute of Safety and Occupational Health (NIOSH):

- First-line supervisors should not expose new employees to hot conditions for more than 20 percent of the workday the first day and an additional 20 percent exposure each day thereafter, and

- Employees with previous experience for the same job should expect 50 percent heat exposure on the first day, 60 percent the 2nd day, 80 percent the 3rd day, and 100 percent the 4th day.

45.7.2 Hydration for Employees Working in the Heat

The first-line supervisor shall ensure employees have access to cool potable drinking water near their work area(s) and encourage them to drink an adequate quantity to remain sufficiently hydrated.

45.7.3 Access to Shade for Employees Working in the Heat

First-line supervisors shall ensure employees have access to shade that is open to the air or provided with ventilation or cooling. Alternative measures (e.g., misting machines) may be used if they are feasible and as effective as shade to cool employees.

45.7.4 Monitoring for Heat Stress

As necessary, the first-line supervisor, in coordination with the regional/local IH and/or safety manager/specialist, shall assess employee exposures to environmental heat. Use of a device capable of assessing the Wet Bulb Globe Temperature (WBGT) is recommended. If a WBGT monitor is not available, then the OSHA-NIOSH Heat Safety Tool app can provide recommendations to prevent heat-related illnesses (link in paragraph 45.9, *References*).

45.7.5 Cold Acclimatization

The first-line supervisor shall work in coordination with the safety manager/specialist and the regional/local IH, to develop a work/rest plan for job tasks in cold environments. The acclimatize plan shall cover new workers, and those returning after time away from work, by gradually increasing their workload and allowing more frequent breaks in warm areas, as they build up a tolerance for working in the cold environment.

45.7.5.1 Monitoring for Cold Stress Using the Wind Chill Guide

First-line supervisors should use the NOAA windchill temperature chart when planning job tasks in cold environments and assess employee exposures to environmental cold (link in paragraph 45.9, *References*).

45.8 Definitions

Acclimatization	Temporary adaptation of the body to work in the heat or cold that occurs gradually with exposure. Acclimatization peaks in most people within 4 to 14 days of regular work for at least 2 hours per day in the heat.
Chilblains	Painful inflammation of small blood vessels in the skin that occur in response to repeated exposure to cold, but nonfreezing temperatures. Small blood

	vessels in the skin may become permanently damaged by cold temperatures resulting in redness and itching during additional exposures.
Environmental risk factors for heat illness	Working conditions that create the possibility that heat illness could occur, including air temperature, relative humidity, radiant heat from the sun and other sources, conductive heat sources such as the ground, air movement, workload severity and duration, protective clothing and personal protective equipment worn by employees.
Frostbite	Freezing of the skin and tissues. Frostbite can cause permanent damage to the body and, in severe cases, can lead to amputation.
Heat cramps	A heat-related illness characterized by spastic contractions of the voluntary muscles (mainly arms, hands, legs, and feet), usually associated with restricted salt intake and profuse sweating without significant body dehydration.
Heat exhaustion	A heat-related illness characterized by elevation of core body temperature above 100.4 degrees Fahrenheit and abnormal performance of one or more organ systems, without injury to the central nervous system. Heat exhaustion may signal impending heat stroke.
Heat illness	A serious medical condition resulting from the body's inability to cope with a particular heat load and includes heat cramps, heat exhaustion, heat syncope, and heat stroke.
Heat stroke	An acute medical emergency caused by exposure to heat from an excessive rise in body temperature above 106 degrees Fahrenheit and failure of the temperature-regulating mechanism. Injury occurs to the central nervous system characterized by a sudden and sustained loss of consciousness preceded by vertigo, nausea, headache, cerebral dysfunction, bizarre behavior, and excessive body temperature.
Hypothermia	Occurs when the normal body temperature (98.6 degrees Fahrenheit) drops to less than 95 degrees Fahrenheit. Exposure to cold temperatures causes the body to lose heat faster than it can be produced. Prolonged exposure to cold will eventually use up the body's stored energy. The result is hypothermia, or abnormally low body temperature. Hypothermia is most likely at very cold temperatures, but it can occur even at cool temperatures (above 40 degrees Fahrenheit) if a person becomes chilled from rain, sweat, or immersion in cold water.
Trench foot	A non-freezing injury of the feet caused by prolonged exposure to wet and cold conditions. It can occur in temperatures as high as 60 degrees Fahrenheit if feet are constantly wet.
Wet bulb globe thermometer (WBGT)	The WBGT is a measure of the heat stress in direct sunlight, that considers temperature, humidity, wind speed, sun angle, and cloud cover (solar radiation).

Wind Chill Wind chill describes the rate of heat loss from the human body, resulting from the combined effect of low air temperature and wind speed.

45.9 References

- National Institute for Occupational Safety and Health (NIOSH) 2016, Criteria for Recommended Standard: *Occupational Exposure to Heat and Hot Environments*.
<https://www.cdc.gov/niosh/docs/2016-106/pdfs/2016-106.pdf?id=10.26616/NIOSH PUB2016106>
- National Institute for Occupational Safety and Health (NIOSH). *Heat Stress Acclimatization*.
<https://www.cdc.gov/niosh/mining/UserFiles/works/pdfs/2017-124.pdf>
- National Oceanic and Atmospheric Administration. *Wind Chill Chart*.
<https://www.weather.gov/safety/cold-wind-chill-chart>
- Occupational Safety and Health Administration. *Winter Weather*. <https://www.osha.gov/winter-weather/cold-stress#affected>.
- Occupational Safety and Health Administration. Using the Heat Index: *Guide for Employers*.
<https://www.osha.gov/heat/heat-index>
- Centers for Disease Control and Prevention. *OSHA-NIOSH Heat Safety Tool*.
<https://apps.apple.com/us/app/osha-niosh-heat-safety-tool/id1239425102>
- Centers for Disease Control and Prevention. Limiting Heat Burden While Wearing Personal Protective Equipment (PPE). https://www.cdc.gov/niosh/topics/heatstress/heat_burden.html
- Occupational Safety and Health Administration. *Heat Safety Tool* (app).
<https://www.osha.gov/heat/heat-app>

RECLAMATION MANUAL TRANSMITTAL SHEET

Effective Date: _____

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Ensure all employees needing this information are provided a copy of this release.

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